A Fossil *Haliotis* from the Galápagos Islands

BY

J. WYATT DURHAM

Department of Paleontology, University of California, Berkeley, California 94720

(2 Plates)

Among the important results of the 1964 Galápagos International Scientific Project was the discovery of fossiliferous deposits intercalated among an older volcanic sequence (Durham, 1965). These older rocks underlie the younger volcanic rocks that are exposed over most of the surface of the islands. These older fossiliferous rocks have a late Miocene age (Durham & McBirney, 1975) and crop out in several places along the east coast of Santa Cruz Island, northeast of Academy Bay. Marine fossils occur in them at several different localities. The fossil collections made at these places are in the Museum of Paleontology of the University of California at Berkeley (hereinafter abbreviated as UCMP).

These Galápagos fossil collections are quite diverse in their contents but have not been studied in detail. They contain numerous Mollusca, Bryozoa, ahermatypic corals, barnacles, echinoid spines and calcareous algae. Among the more conspicuous fossils is a large pecten that is difficult to differentiate from *Lyropecten crassicardo* (Conrad, 1857) of the California upper Miocene. At one locality (UCMP B-3612) a very diverse fauna was found. The ahermatypic corals present suggest that the deposit was formed at depths of 10 m or somewhat more. The field observations plus some of the rock-inhabiting taxa present suggest that it was formed at the base of a steep shore, perhaps even a cliff of basalt. One of the obvious fossils collected was a small *Haliotis*. Because fossil haliotids are rare and because this specimen is not assignable to the living Galápagos species, *Haliotis dalli* Henderson, 1915, it is described in this note.

James H. McLean and Gale Sphon of the Los Angeles County Museum (hereafter abbreviated LACM) have generously loaned me specimens of *Haliotis dalli* and *H. roberti* for comparison and permitted me to illustrate them. The manuscript has benefitted from discussions with Carole S. Hickman and Joseph H. Peck, Jr.

SYSTEMATICS

Haliotis Linnaeus, 1758

Type species: *Haliotis asinina* Linnaeus, 1758

The shell of *Haliotis asinina* is very elongate and narrow, with a very eccentric apex. Few species are assignable to the typical subgenus. In the Treatise on Invertebrate Paleontology (Moore, 1960), 11 subgenera of *Haliotis* are recognized. Fleming (1952) has also discussed some of the haliotid supraspecific taxa. *Haliotis dalli* Henderson, 1915 from the Galápagos Islands and *H. roberti* McLean, 1970 from Cocos Island have both been referred to the subgenus *Padollus* Montfort and the new fossil species seems to belong to the same group.

(Padollus) Montfort, 1810

Type species: *Padollus rubicundus* Montfort, 1810, ?= *Haliotis scalaris* Leach, 1814

This subgenus is characterized by fairly tight coiling, a spire rising above the general whorl surface, a broad spiral rib, with corresponding groove on the interior, adapical to the row of tremata, spiral cording, and whorl periphery extending beyond labral margin (see Figure *10*).

Neither *Haliotis roberti* nor the common variants of *H. dalli* have been well illustrated. Inasmuch as excellent material of each species is available as well as some unpublished distributional data, both species are here illustrated, discussed, and compared with the fossil species.

Haliotis (Padollus) dalli Henderson, 1915

(Figures *1, 2, 3, 4, 5*)

Haliotis pourtalesii ? Dall, 1890 (not 1889): 355; plt. 12 figs. 1, 3; – Stearns, 1893: 418, 448

Haliotis pourtalesii Pilsbry, 1890, Man. Conch. (1) 12: 121; plt. 22, figs. 27, 28, *non* Dall, 1881
Haliotis (Padollus) dalli Henderson, 1915: 661; plts. 45, 46, lower figs.; – Keen, 1971: 308, 311 (fig. 1); – Abbott, 1974: 18, no. 32

Seventeen specimens of this uncommon species have been available for study. They show much variation in height of spire, heaviness of cords, and presence or absence of undulating radial ribs. The most constant feature is the number of spiral cords at a given diameter. New cords are added by intercalation with increase in size; as a result the relative strength of a cord may increase from its inception to the aperture. On the largest specimen (Figure 2) there are about 1½ nuclear whorls before the first trema appears; at this point there are about 10 cords above the trema – at the apertural edge there are about 52. On this specimen there are 27 tremata (plus one partial), of which at least 4 are open. The heaviness of the cords is variable (compare Figures *1* and *3*) as is the presence of radial ribs. The type specimen as figured by Henderson (1915) lacks radial ribs and the spiral cords are only moderately developed. The specimen illustrated in Figure *1* approaches the type rather closely except that it is somewhat smaller. The specimen illustrated in Keen (1971: 311; fig. 1) and refigured here (Figure *3*) has heavily developed cords and well marked radial ribs in contrast to a similar sized specimen (Figure *2*) with strongly developed radial ribs and less strongly developed cords. Similar sized specimens vary considerably in proportions (measurements made with aperture on a horizontal surface). The 2 largest specimens (Figures *2, 3*) have major diameters of 27.1 and 27.4 mm; their respective heights (not height of spire) are 10.7 and 8.4 mm, the number of tremata 28+ and 27+. The total height (axis of coiling vertical) is about 16 and 20 mm.

The tremata are formed by periodic constrictions (Figures *5, 8*) of a slit (which begins at the end of the nuclear whorls) in the outer layers of the shell. The older tremata are closed by deposition of the innermost nacreous layers. The constrictions are formed by projections

Explanation of Figures *1* to *8*

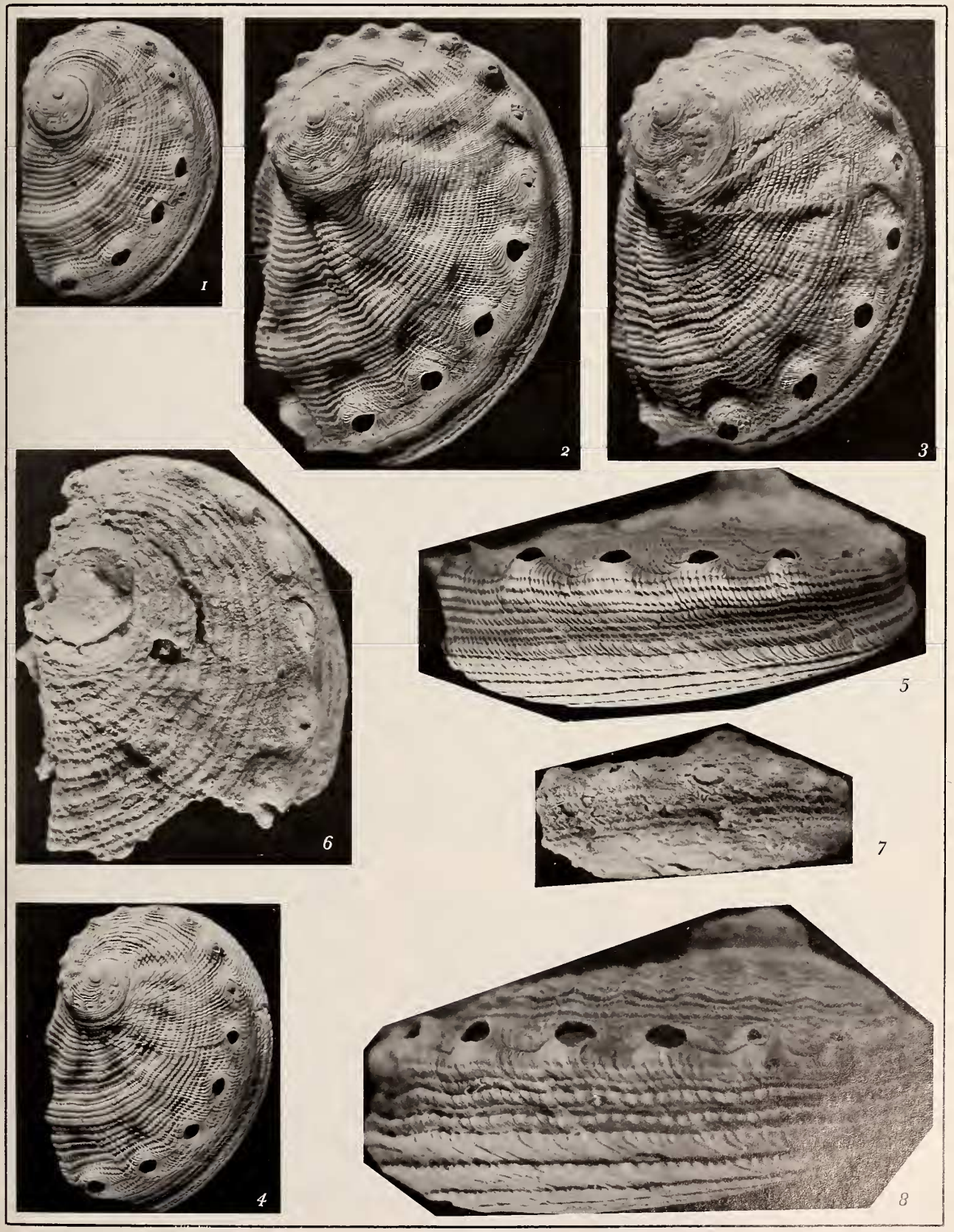
Specimens in Figures *1* to *5* photographed with apertures resting on horizontal surface

Figure *1*: *Haliotis (Padollus) dalli* Henderson, LACM loc. 148-34, ornamentation compares well with that of holotype as figured by Henderson (1915) × 4
Figure *2*: *Haliotis (Padollus) dalli* Henderson, LACM loc. 72-197, variant with low spire and strong radial ribs × 3
Figure *3*: *Haliotis (Padollus) dalli* Henderson, LACM loc. 30142, variant with high spire and moderate radial ribs (specimen illustrated by Keen, 1971: 311, fig. 1) × 3
Figure *4*: *Haliotis (Padollus) dalli* Henderson, LACM loc. 72-197 variant with low spire and moderate radial ribs × 2.7
Figure *5*: *Haliotis (Padollus) dalli* Henderson, same specimen as Figure *4*, lateral view × 6
Figure *6*: *Haliotis (Padollus?) santacruzensis* Durham, spec. nov. UCMP 14589, loc. B-3612 × 6.7
Figure *7*: *Haliotis (Padollus?) santacruzensis* Durham, spec. nov. same specimen as Figure *6*, lateral view × 5.5
Figure *8*: *Haliotis (Padollus) roberti* McLean, holotype, LACM 1368, lateral view × 6

Explanation of Figures *9* to *17*

Specimens in Figures *9, 11, 12, 13, 15* photographed with apertures resting on horizontal surface

Figure *9*: *Haliotis (Padollus) roberti* McLean, paratype, LACM 1369, apertural edge broken × 4
Figure *10*: *Haliotis (Padollus) dalli* Henderson, LACM loc 30142 (same specimen as Figure *3*), apertural view of high spired individual showing smooth flattened columellar lip (lower right and subcentral) × 2.9
Figure *11*: *Haliotis (Padollus) dalli* Henderson, LACM loc. 30143, high spired individual with moderate radial ribs (attached homotrematid foraminifera below spire) × 3
Figure *12*: *Haliotis (Padollus) roberti* McLean, holotype, LACM 1368, same specimen as Figure *8* × 3
Figure *13*: *Haliotis (Paua) iris* Martyn, hypotype UCMP 14590, loc. D-7558, apical whorls very eccentric × 0.88
Figure *14*: *Haliotis (Paua) lomaensis* Anderson, holotype CAS 69, oblique view of latex cast (apex at top) of interior of incomplete external half of holotype (shell material preserved) showing 4 open and 2 closed tremata at top × 6
Figure *15*: *Haliotis (Paua) lomaensis* Anderson, holotype, CAS 69, nearly entire specimen except for missing shell material (attached to original of Figure *14*). Apical whorls at center of top, note outer lip extending around apex and joining columellar flange on right side × 6
Figure *16*: *Haliotis (Paua) iris* Martyn, same specimen as in Figure *13*, aperture inclined, note outer lip extending around apical whorls and merging with columellar flange × 0.88
Figure *17*: *Haliotis (Paua) iris* Martyn, interior of same specimen as in Figures *13* and *16*, note impressed adductor muscle scar and pallial line (lower left) as well as smooth inner surface of combined outer lip-columellar flange on right side × 1


1
2
3
4
5
6
7
8